

for each position in the series of sequential positions of the object,

determining a plurality of free neighborhoods, each free neighborhood corresponding to one of the plurality of entities,

determining a subset of the entities comprising entities having a trajectory through their corresponding free neighborhood during motion of the object from a current position to a next position,

generating a trace of the motion of the subset of entities between the current and the next position, and

constructing a representation of the swept volume from the generated traces.

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end
- 2) The software control method of claim 1 wherein the plurality of entities comprises an edge.
  - 3) The software control method of claim 1 wherein the plurality of entities comprises a triangle.
  - 4) The software control method of claim 1 wherein a first one of entities is a vertex formed at an intersection of a first and a second edge of the modeled object and a corresponding first one of the free neighborhoods is defined by an angular extension of the first and second edges.
  - 5) The software control method of claim 1 wherein a first one of the free neighborhoods comprises a material zone represented by a half sphere containing material of the modeled object and delimited by a plane of a triangle.
  - 6) The software control method of claim 1 wherein a first one of the free neighborhoods comprises a tangent zone represented by two portions of a sphere, wherein the two portions of the sphere are delimited by planes of adjacent triangles.

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- 9) The software control method of claim 1 wherein the motion between two consecutive matrices is modeled as linear motion.
- 10) The software control method of claim 1 wherein each free neighborhood comprises an area in which motion of the corresponding entity comprises motion on the boundary of the modeled swept volume.
- 11) A computer system for controlling generation of a swept volume model, the system comprising:
- a processor operatively interconnected to a memory;
  - a user input device;
  - a display; and
  - a graphical user interface responsive to activation with the user input device by causing a program stored in the memory to be executed by the processor, said program configuring the processor to perform computations whereby:
    - a polyhedral representation comprising a plurality of entities of a computer modeled object is generated,
    - motion of the object is represented with a set of position matrices,
    - for each of a series of sequential positions of the object represented by the matrices,
      - a subset of the entities comprising entities remaining within their corresponding free neighborhood during motion of the object from a current to a next position is determined, and traces are generated by the motion of the subset of entities during motion between a current and a next position, and
      - a representation of the swept volume is constructed from the traces.

- A2  
end
- 12) The computer system of claim 11 wherein the position matrices representing motion comprise data collected during physical experiments.
- 13) The computer system of claim 11 wherein the position matrices representing motion of the free neighborhood entities are calculated in response to selection of a motion type from a user interactive menu.
- 14) The computer system of claim 11 wherein a first one of the entities comprising an edge has a corresponding free neighborhood comprising a tangent zone, and the first entity is determined to be a member of the subset based on testing to detect movement of the edge through the tangent zone.
- 15) The computer system of claim 11 wherein a first one of the entities comprising a triangle has a corresponding free neighborhood comprising a material zone, and the first entity is determined to be a member of the subset based on testing for movement of the triangle through the material zone.
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- A3  
cont.
- 17) A computer program residing on a computer-readable medium, the program comprising instructions for causing the computer to:
- generate a polyhedral representation of a computer modeled object, the representation comprising a plurality of entities;
- represent motion of the object with a set of position matrices representing sequential positions of motion of the object; and
- for each of a series of sequential positions of the object,
- determining a plurality of free neighborhoods, each free neighborhood corresponding to one of the plurality of entities
- determine a subset of the entities comprising entities having a trajectory through their corresponding free neighborhood during motion of the object from a current position to a next position represented by the matrices,

generate a trace of the motion of the free neighborhood entities between the current and the next position; and

construct a representation of the swept volume from the generated traces.

- A3  
end
- 18) The computer program residing on a computer-readable medium of claim 19 wherein each free neighborhood comprises an area in which motion of the corresponding entity comprises motion on the boundary of the modeled swept volume.
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Claim Amendments (marked-up form)

- 1) A software control method of modeling a swept volume for a computer simulated object comprising:

generating a polyhedral representation of a computer modeled object, the representation comprising a plurality of entities;

representing motion of the object ~~with a set of position matrices~~ by a series of sequential positions of the object; and

for each position in the series of sequential positions of the object,

determining a plurality of free neighborhoods, each free neighborhood corresponding to one of the plurality of entities,

determining a subset of the entities comprising entities having a trajectory through their corresponding free neighborhood during motion of the object from a current position to a next position, ~~free neighborhood entities comprising the object for each matrix;~~

generating a trace of traces by the motion of the free neighborhood entities the subset of entities between the current and the next position; and

constructing a representation of the swept volume from the generated traces.